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## TITLE OF THE INVENTION

## ELECTRO-STATIC DISSIPATIVE SWAB

## BACKGROUND OF THE INVENTION

[0001] This invention pertains to a swab for cleaning electro-static sensitive items. More particularly, the invention pertains to a swab that is electro-static dissipative for cleaning items that are electro-static sensitive.

[0002] Swabs are used in all manners of cleaning. For example, everyone will recognize common cotton tip swabs that are used for personal hygiene and care. Swabs are compact in nature and effective for cleaning small, otherwise inaccessible areas. As such, they have been adopted for use in numerous areas of technology and manufacture. One such area is the manufacture of electrical components and more specifically magnetic storage media, such as disk drives.

[0003] Many types of electrical equipment, such as magnetic storage media, for example, hard disk drives, are sensitive to static electricity. That is, discharge of static electricity that contacts these components can result in damage and even failure of the equipment. To this end, precautions must be taken when contacting these components during manufacture and cleaning.

[0004] In the manufacturing process, it is often necessary to clean the components at various stages of assembly. To this end, precautions must be taken in order to assure that static electricity discharges do not contact or approach these components. Often, individuals working on these components must be grounded in order to prevent such electrostatic discharges.

[0005] Static dissipative products, such as static dissipative wipes are known in the art. However, there are a number of drawbacks to these known products. For example, one known product is formed as a swab and includes an electro-static dissipative handle having a polyester cleaning head portion. In order to provide the desired electro-static dissipative properties, the polyester head portion must be wetted or dampened. In many instances, it is not desirable to use water or other wetting solutions on the cleaning device. Other known cleaning



devices have electro-static dissipating properties. However, the time necessary to discharge from a given, known static voltage to a desirable near-ground voltage is too great for use in a production assembly mode.

[0006] Accordingly, there exists a need for a cleaning device having electro-static dissipative properties. Desirably, such a device includes a relatively soft cleaning head portion. More desirably, such a device can be used without wetting the cleaning head portion in order to activate the static dissipative properties. Most desirably, such a device provides rapid static electricity dissipation properties, to allow for use in a production assembly operating mode.

#### BRIEF SUMMARY OF THE INVENTION

[0007] An electro-static dissipating swab has an elongated handle defining a longitudinal axis, and has a cleaning head end and a grasping end. The cleaning head end defines a securing region. The handle is formed from an electro-static dissipative material. A preferred material for the handle is a modified polybutylene terephthalate.

[0008] A cleaning head or tip is formed from an electro-static dissipative material and is secured to the handle cleaning head end. The handle and cleaning tip define a longitudinal axis. The cleaning tip can be formed from a sealed conductive fabric, a knit polyester, a conductive foam, a micro-porous foam, wrapped conductive fabric ribbon, and the like.

[0009] The swab, in a dry state, dissipates a static electrical charge from a charge plate having a 20 picofarad capacitance at a charge of 1000 volts to a charge of less than 10 volts in less than about 500 milliseconds and in a wetted state dissipates a static electrical charge from a charge plate having a 20 picofarad capacitance at a charge of 1000 volts to a charge of less than 10 volts in less than about 100 milliseconds.

[0010] These and other features and advantages of the present invention will be apparent from the following detailed description, in conjunction with the appended claims.

#### BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0011] The benefits and advantages of the present invention will become more readily apparent to those of ordinary skill in the relevant art after reviewing the following detailed description and accompanying drawings, wherein:

[0012] FIG. 1 illustrates one embodiment of an electro-static dissipative swab embodying the principles of the present invention, the swab illustrated being a spiral wound swab;

[0013] FIG. 2 is an alternate embodiment of the swab, formed as a sealed sheet material swab, the material being a foam or fabric;

[0014] FIG. 2a is an enlarged view of the cleaning head portion of the swab of FIG. 2;

[0015] FIG. 2b illustrates a static dissipative sheet material such as fabric or foam prepared for sealing to form the swab of FIG. 2;

[0016] FIG. 2c illustrates the placement of the handle portion on the sheet material of FIG. 2b for forming the swab of FIG. 2;

[0017] FIG. 2d is a side view of the swab head of FIG. 2b; and

[0018] FIG. 3 illustrates yet another form of the swab, that being a pre-sized foam shape, such as a cylindrical foam cleaning head portion press fit onto a conductive handle.

#### DETAILED DESCRIPTION OF THE INVENTION

[0019] While the present invention is susceptible of embodiment in various forms, there is shown in the drawings and will hereinafter be described presently preferred embodiments with the understanding that the present disclosure is to be considered an exemplification of the invention and is not intended to limit the invention to the specific embodiments illustrated. It should be further understood that the title of this section of this specification, namely, "Detailed Description Of The Invention", relates to a requirement of the United States Patent and Trademark Office,

and does not imply, nor should be inferred to limit the subject matter disclosed and claimed herein.

[0020] Referring now to the figures and in particular to FIG. 1, there is shown one embodiment of a static dissipative swab 10 embodying the principles of the present invention. The swab 10 includes generally a handle 12 and a cleaning head portion 14 at a grasping end of the handle 12. The handle 12 is elongated and defines a longitudinal axis, as indicated at A. The elongated handle facilitates reaching into otherwise difficult to reach, or possibly inaccessible areas for cleaning.

[0021] In a present embodiment, the handle 12 is made from a modified polybutylene terephthalate such as that commercially available from West Coast Polymers, of Los Alamitos, California, as product RTP1099X87257B. It has been found that this particular material provides excellent electro-static dissipative properties in a cost effective and readily available material.

[0022] The RTP material is provided in bulk polymer form, such as in pellet form, and is molded, such as by injection or extrusion molding, to form the handle 12. The handles 12 can be cut to a desired length and can be contoured (e.g., tapered) by, for example cutting or molding, as desired.

[0023] The cleaning head portion 14 is secured to the handle 12 at a securing region 13. The cleaning head portion or cleaning tip 14 can be formed from, for example, foam, conductive foam, micro-porous foam, polyester, sealed conductive fabric and wrapped conductive fabric. In one present embodiment as seen in FIG. 1, the swab 10 is formed from a spiral wrapped conductive fabric. This fabric may be formed as a knit tube that eliminates edges that can otherwise fray and result in generating undesired particulate matter. It has been found that fabric cleaning heads provide excellent wicking action and are typically cleaner than some other types of materials.

[0024] The cleaning head portion can be formed using any of a variety of processes, and having a variety of differing constructions. Referring to FIG. 1, the head 14 can be formed from a strip of static-dissipative material 16 that is spiral wrapped around the handle 14 and sealed onto itself at a terminal end 18. The spiral

wrapping is carried out by overlapping the strip 16 onto itself, which secures it on the handle 14.

[0025] FIGS. 2-2d illustrate another embodiment of the swab 110 in which the head 114 is formed from a sheet 116 that is sealed around the handle 12 and sealed to itself along a longitudinal seam 118 and sealed to the handle by, for example, ultrasonic energy (i.e., ultrasonic welding), heat sealing or the like. A seal 120 can be formed to secure the head 114 to the handle 12.

[0026] Still further, as seen in FIG. 3, the swab 210 head 214 can be formed as a plug-like element 216 (e.g., seam-less tube) having a central opening 218 that is configured and sized to frictionally fit onto the handle 12. The plug-like element 216 can then be affixed to the handle 12 by ultrasonic welding, heat sealing, application of an adhesive or the like.

[0027] It has been found that a swab 10, 110, 210 formed in accordance with the principles of the present invention provides significantly faster static charge dissipative properties. Prior known swabs have been observed to require considerably longer time to dissipate a static charge of about 1,000 volts to less than 10 volts. A present swab 10, 110, 210 has been found to dissipate this charge in less than about 355 milliseconds to about 85 milliseconds.

[0028] In addition, it has been found that a swab 10, 110, 210 in accordance with the present invention dissipates this static electric charge without required wetting. That is, the static dissipative properties or characteristics are observed even with the swab 10, 110, 210 fully dried. In known wet process operations, safeguards were required to assure that the wetting fluid did not evaporate too quickly thus reducing or eliminating (i.e., losing) its electro-static dissipative properties. The present swabs provide these properties without requiring constant monitoring and/or reapplication of wetting fluid.

[0029] In the present disclosure, the words "a" or "an" are to be taken to include both the singular and the plural. Conversely, any reference to plural items shall, where appropriate, include the singular.

[0030] From the foregoing it will be observed that numerous modifications and variations can be effectuated without departing from the true spirit and scope of the novel concepts of the present invention. It is to be understood that no limitation with respect to the specific embodiments illustrated is intended or should be inferred. The disclosure is intended to cover by the appended claims all such modifications as fall within the scope of the claims.